

ABSTRACT

A method for designing high performance products incorporating signal processing and feedback control is disclosed. In one embodiment, a block diagram may be used for a design cycle, for design optimization, or for design estimation. The block diagram contains a set of differential equations or difference equations, and the solution of these sets of equations may be performed by commercially available software tools. In order to utilize the software tools without requiring access to source code or other descriptions of the internal structure of the tools, the system is decomposed using the technique of waveform relaxation. The decomposition using waveform relaxation operates directly to speed up the computations for the block diagram system. The remaining interprocessor communications may be held pending until the end of each iteration's calculations in each block, allowing the software tools to be executed on independent multiple processors. Additional low fidelity models may be added to the block diagram to accelerate the convergence. In non-stationary methods, the model representing each block may vary with each successive iteration. The variation may take the form of successively increasing the complexity and therefore the fidelity of each block with each successive iteration, starting with low fidelity models and finishing with high fidelity models.